

# RNA Splicing

\* Mechanism of Splicing →

## 2 Transcription Reactions

### ① 1<sup>st</sup> Transcription Reaction -

- Initiated by Branch Point Adenine

YUARY

(2'OH) →

Nucleophilic attack  
on phosphodiester bond b/w exon 1  
and intron 1

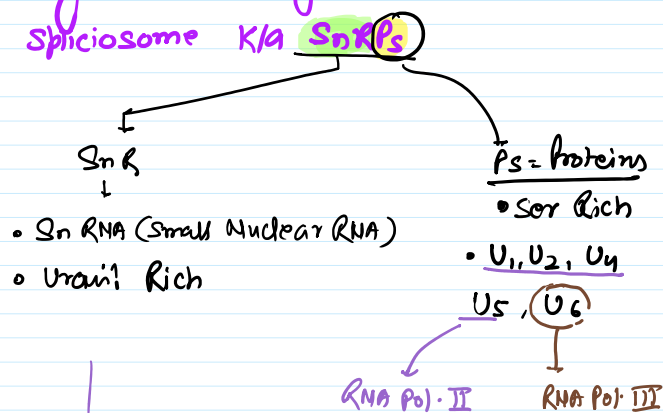
- Formation of New phosphodiester bond  
b/w 5' end of intron and Branch Point  
Adenine

### ② 2<sup>nd</sup> Transcription Reaction

- Exon-1 - 3'OH → Nucleophilic attack on  
phosphodiester bond b/w Exon 2 intron
- Formation of New phosphodiester bond b/w  
Exon-1 and Exon 2

# These Transcription Reaction is Catalysed by  
Spliceosome

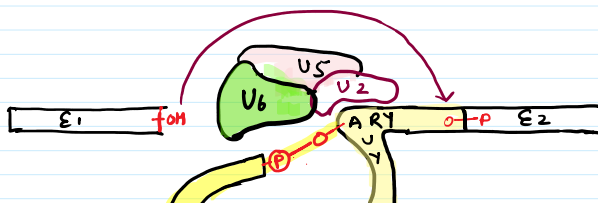
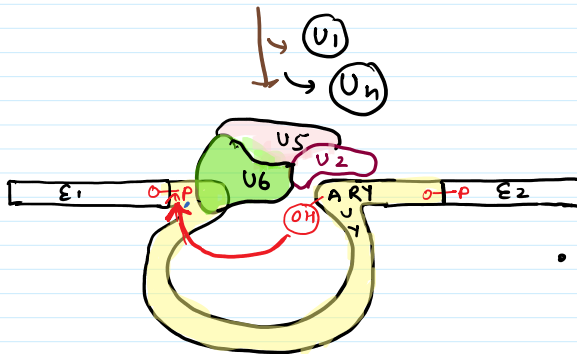
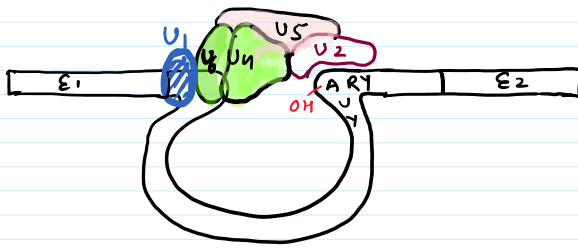
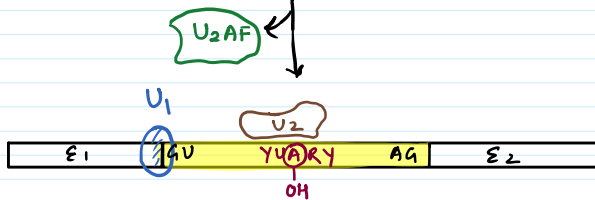
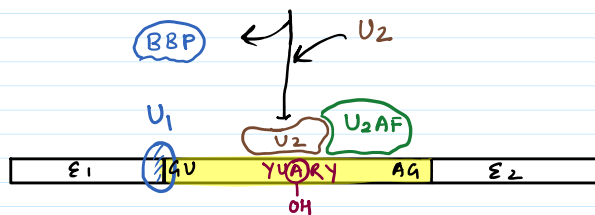
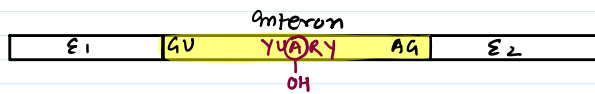
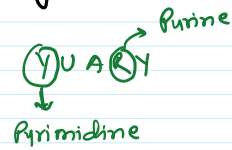
- Provide ↑ Specificity for splicing
- Assembly of spliceosome k/a SnRPs



- Assembly of SnRPs occurs in  
cytoplasm
- working site of SnRPs is Nuclear

# # Splicing of most Common Intron [GU, AG Intron]

Seq.  $\rightarrow$   $\text{tnt}$  at the end of Intron



BBP = Branch Point Binding Protein

U2AF = U2 Auxiliary Factor  
Recruited by BBP

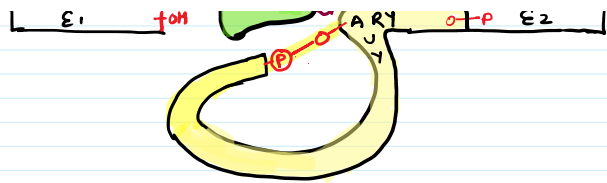
U1 - Protein Binds on Exon 1 & Intron 1 Junction

• Trimeric SnRPs  
Introns and U1 Release

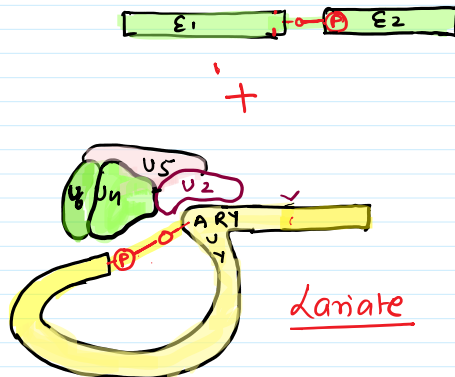
• 1st Transesterification  
Catalysed by Branch Point adenosine

• U6 & U2 Provide catalytic  
✓ Pocket for 1st Transesterification  
Ran

2nd Transesterification



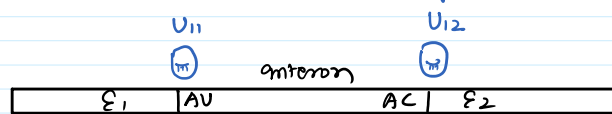
2nd Transesterification  
 Rxn is catalyzed by  
 Exon-1 OH group



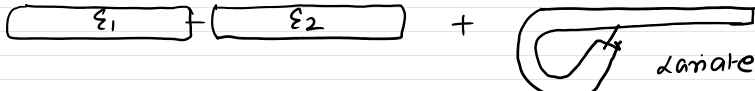
\* During Recruitment  
 of Spliceosome ATP is used  
 But during Splicing ATP  
 does not use

## # Rare Anterion Splicing

Contain AU, AC Seq. At The End



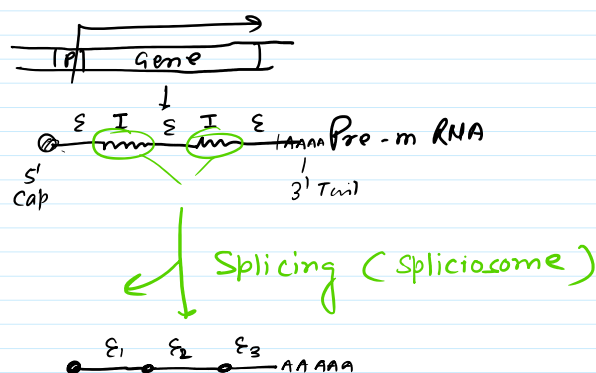
U<sub>11</sub> [modified SnRPs]  
 U<sub>5</sub> [Similar to Pre-RNA Spliceosome]  
 U<sub>6</sub> [modified SnRPs]

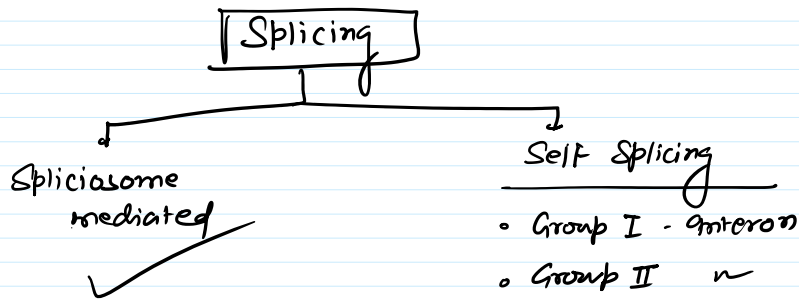


\* Rare Spliceosome +nt in ↑ Eukaryote & in Plants

## # Splicing occurs in Nucleus

Spliceosome +nt inside Nucleus





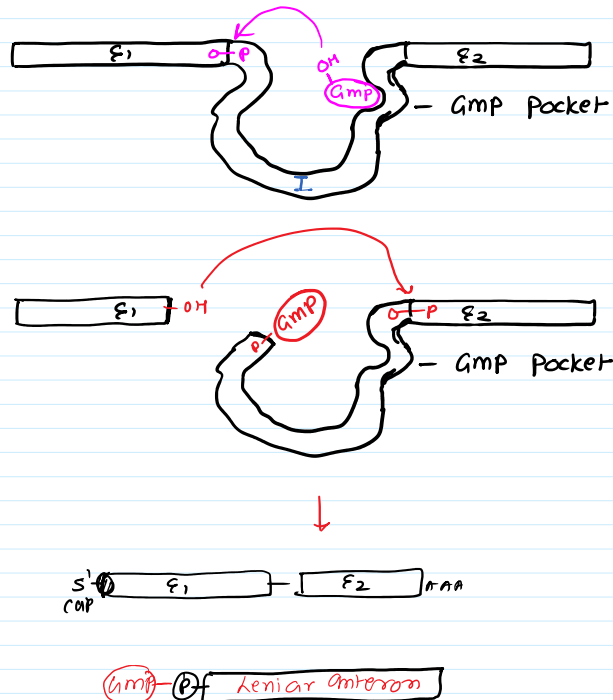
## # Self Splicing

### \* Group II intron -

- Similar with splicesome mediated splicing
- But the reaction occurs without splicesome
- Intron removed in form of lariat

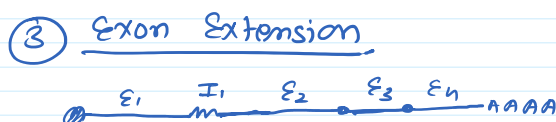
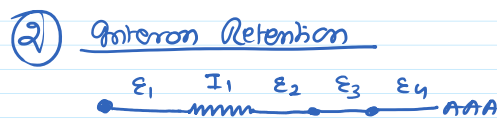
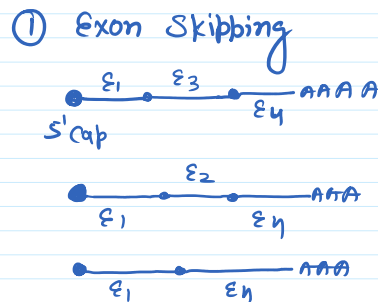
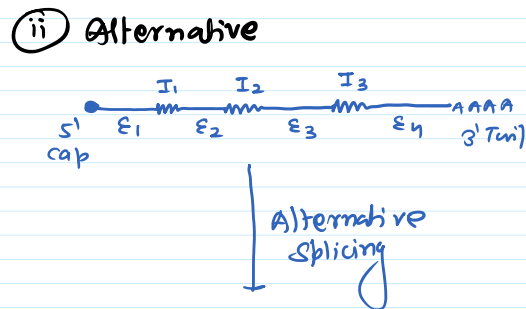
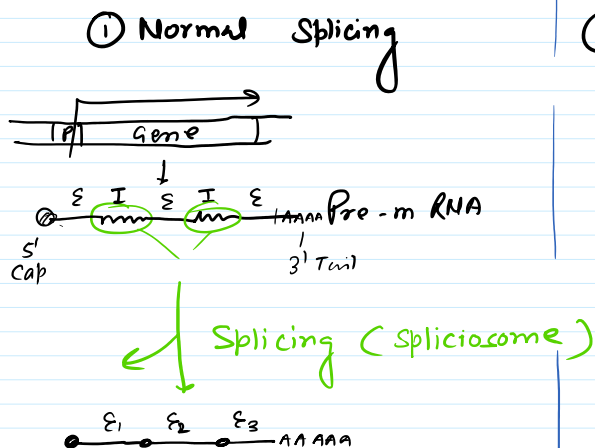
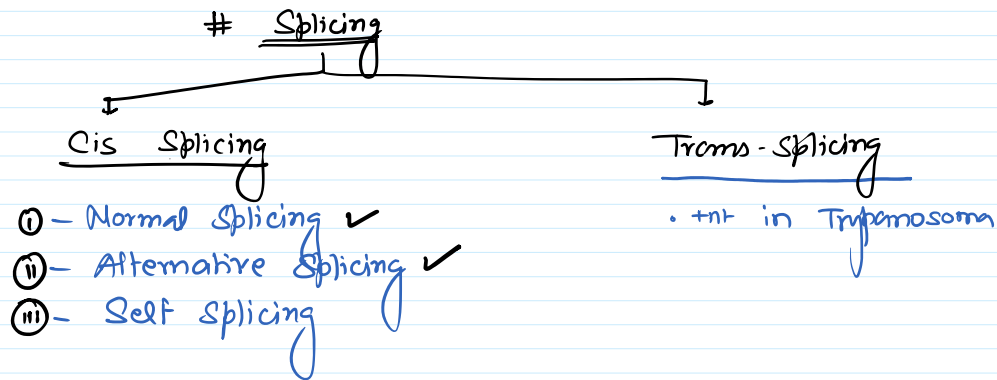
### # Group I intron

- Common in chloroplast, mitochondria & in some lower eukaryotes
- Short length RNA



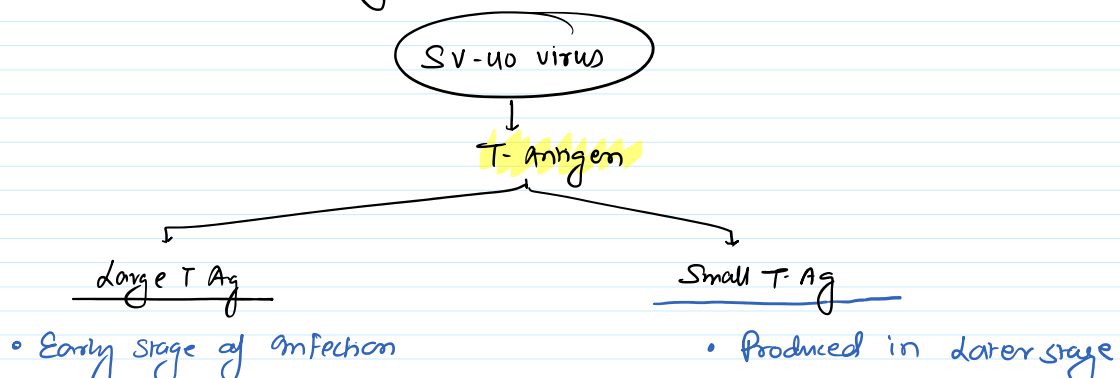
\* Group I intron can be converted into Ribozyme

↓  
RNA that act as enzyme



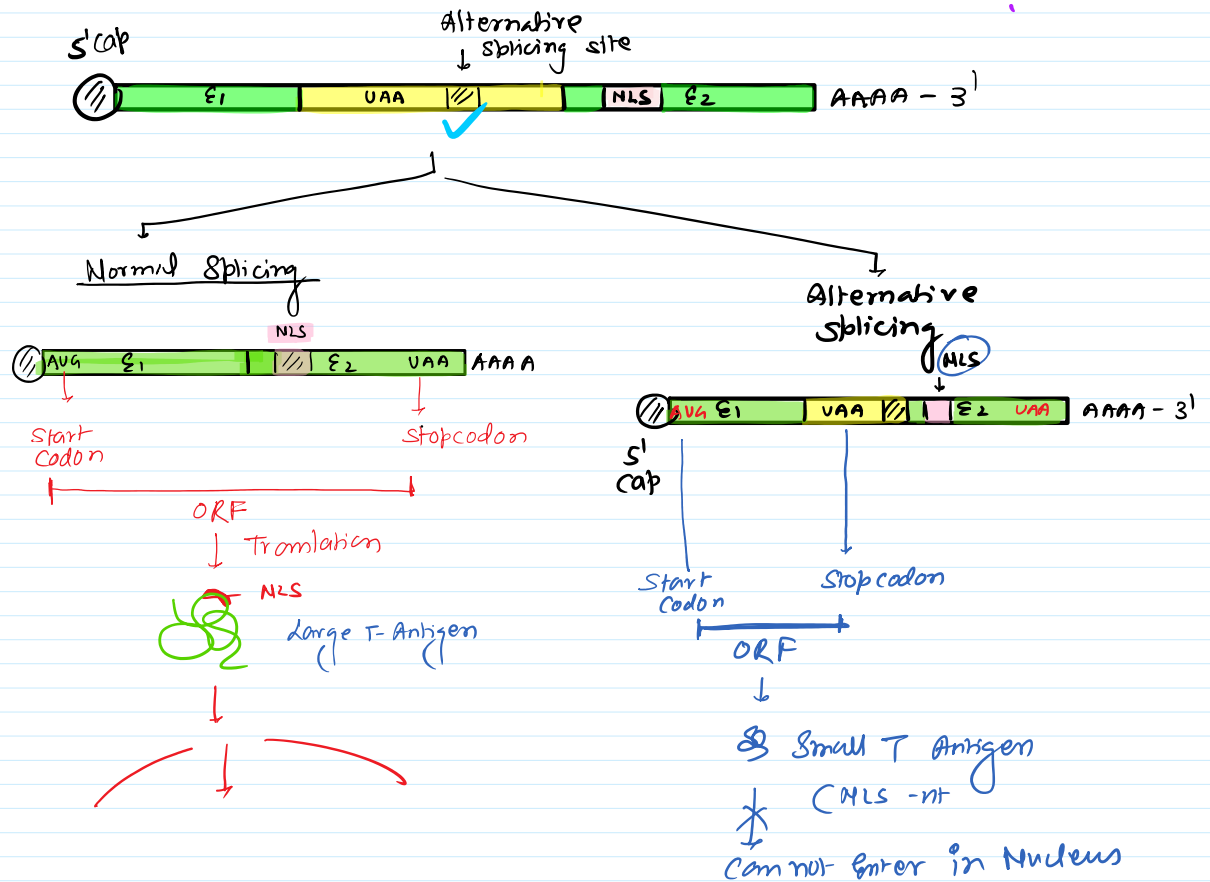
Examples of Alternative Splicing.

① T-Antigen of SV-40 Virus



- Early stage of infection
- Act as Helicase
- works in Nucleus
- Contain NLS [Nuclear Localization Signal]

- Produced in later stage of infection
- Remain +nt in Cytosol
- Helps in Assembly of virus
- NLS -nt
- Can not move inside Nucleus



## # 2nd example of Alternative Splicing

### # Sex Determination in Drosophila

- Based upon Ratio of  $\frac{X \text{ Chromosome}}{\text{Autosome}}$

Ratio

$$2A + 2X = \frac{2}{2} = 1 = \text{♀}$$

$$2A + XXy = \frac{2}{2} = 1 = \text{♀} \checkmark$$

$$2A + Xy = \frac{1}{2} = 0.5 = \text{♂} \checkmark$$

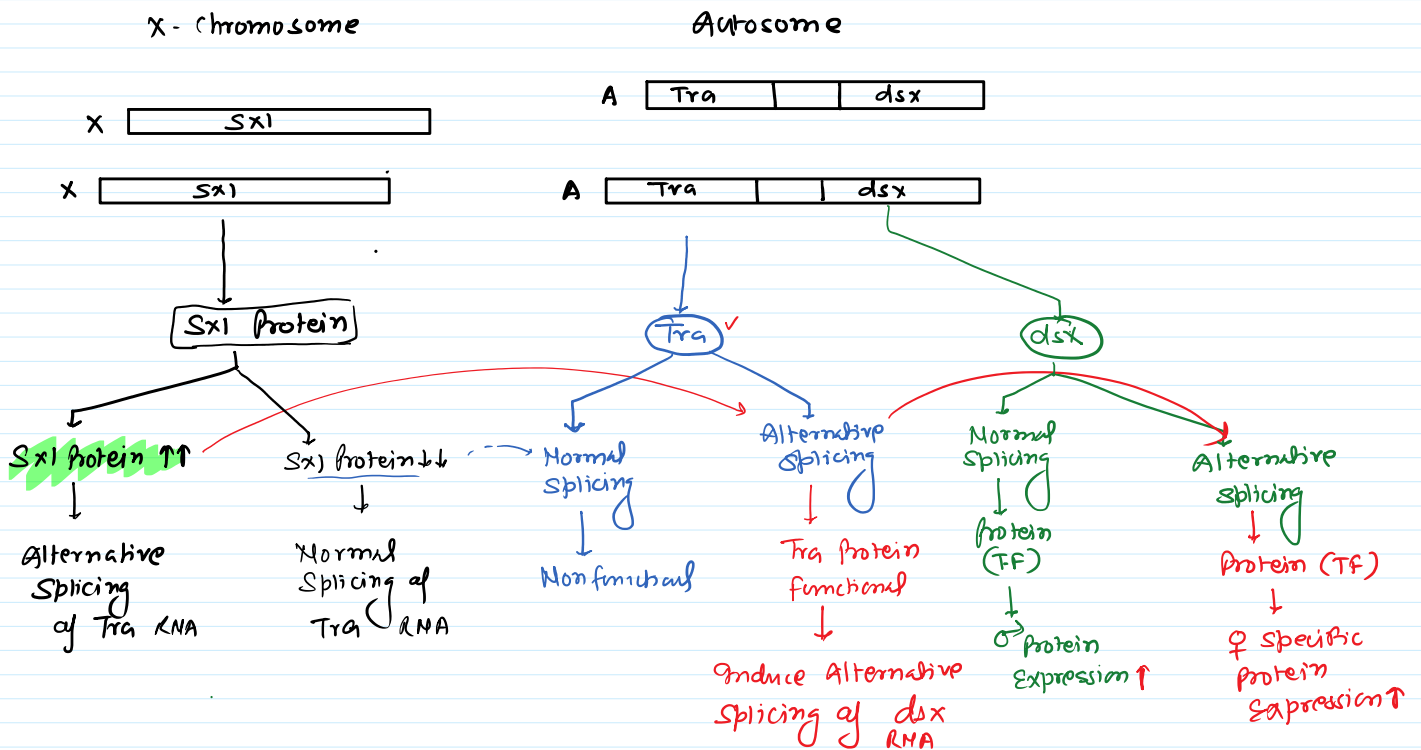
$$2A + XXX = \frac{3}{2} = 1.5 \text{ meta ♀}$$

$$3A + XX = \frac{2}{3} = .6 = \text{intersex}$$

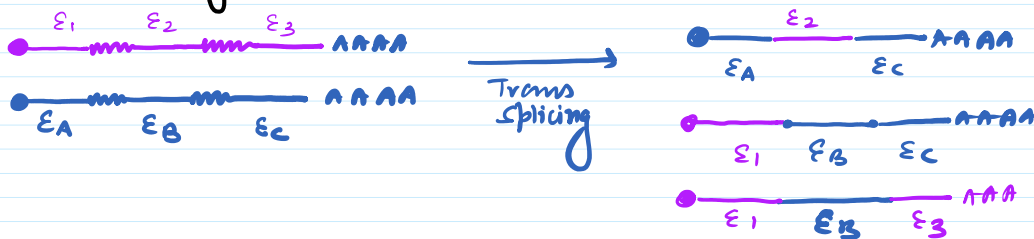
$$1A + XXX = \frac{3}{1} = 3 = \text{meta } \varphi$$

$$3A + XY = \frac{1}{3} = .33 = \text{meta } \delta$$

## molecular mechanism



## # Trans Splicing

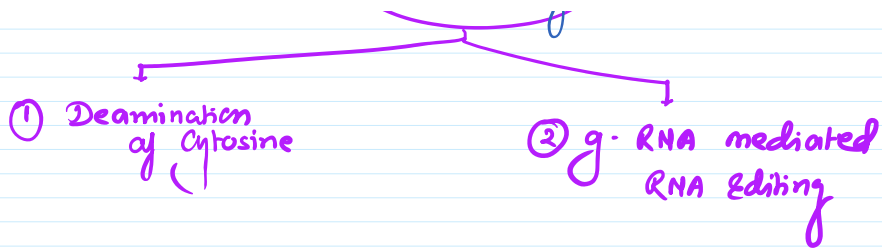


## # RNA Editing [modification in RNA at Transcription level]

\* Post Transcriptional Event

- g RNA play Role in RNA editing
- if RNA Obtained from DNA but the Seq. of RNA does not matched with its DNA

Reason - RNA Editing



eg.

Gene → Sense Strand- 5'ATG CATT C GATA-3'

mRNA Seq. - 5'-AUGCAUUCGAUUCG AUA-3'

Edited mRNA - 5'-AUGUAUUU GAUUU G AUA-3'

Edited mRNA - 5'-AUG U AU - UU GAU U GUAUA-3'

Uracil deletion  
Uracil insertion

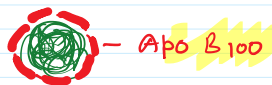
mediated by g RNA

eg = Deamination of Cytosine (RNA Editing)

- eg - Apolipoprotein

Apo B100

- Expressed in liver

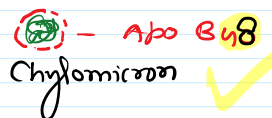


[Apo protein (Apo B100)  
+ lipid]

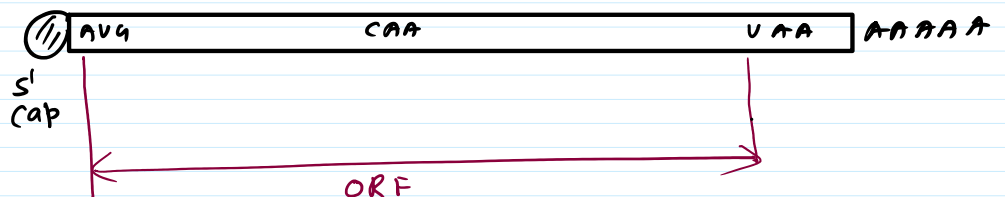
↓  
Apolipoprotein (LDL)

Apo B48

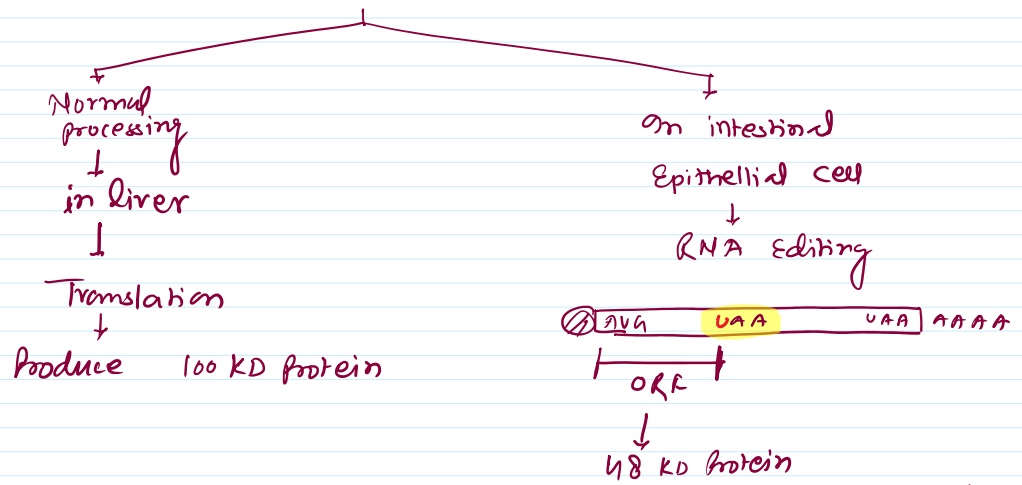
• Express in  
Intestinal Epithelial cell



Chylomicron

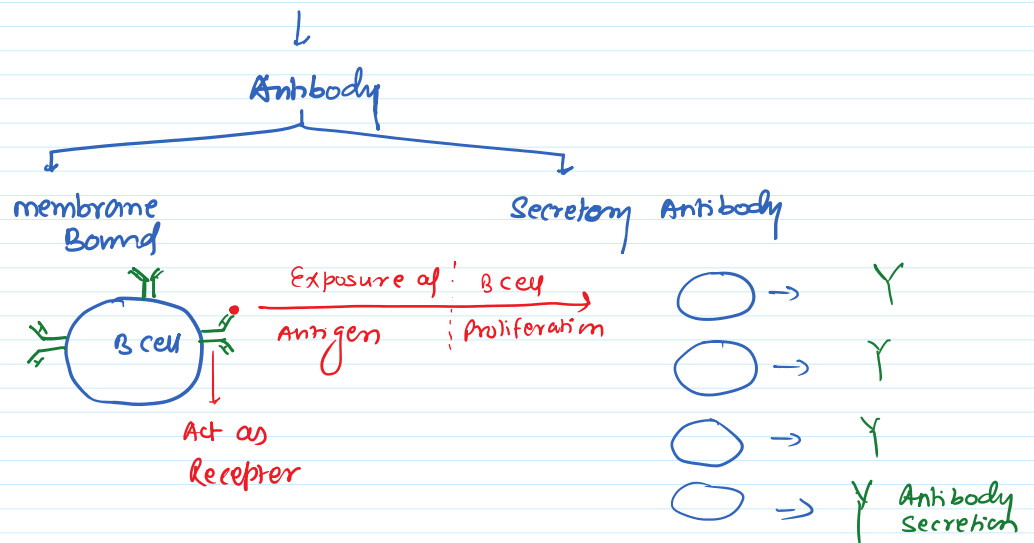






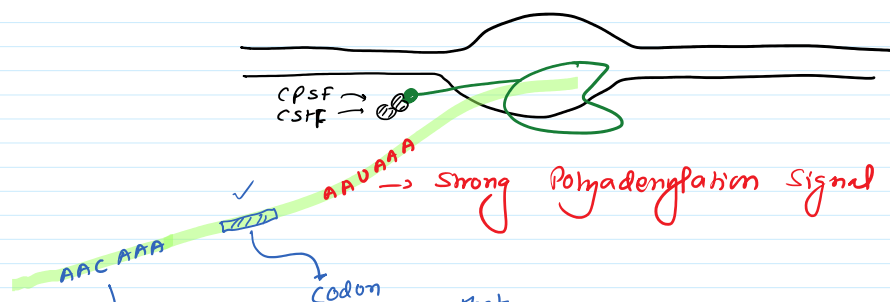
# Alternative Polyadenylation → Another type of modification in RNA during Transcription.

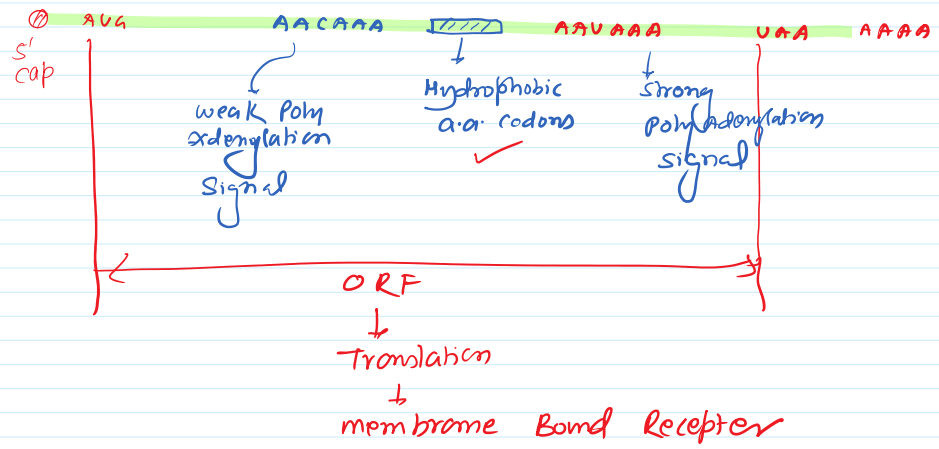
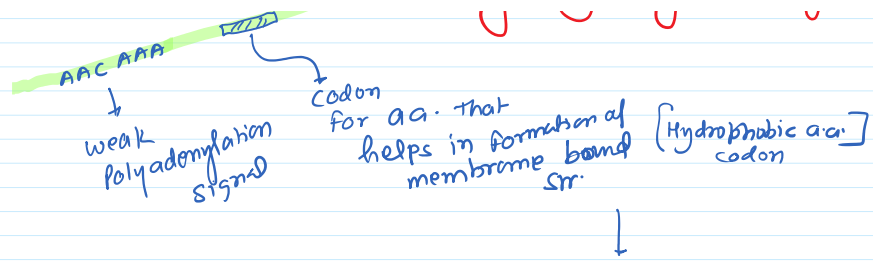
→ observed in Antibody that is produced by B-cell



① Low infection Condition -

CPSF - ↓  
CSTF - ↓ } When these protein are in low amount only strong polyadenylation signal can be recognized





Condition 2 = infection ↑

↳ CPSF 2 cst F ↑ → Recognize weak Polyadenylation signal

